

LA-14005-C

Conference

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Workshop on the Advanced Design of Spoke Resonators Proceedings

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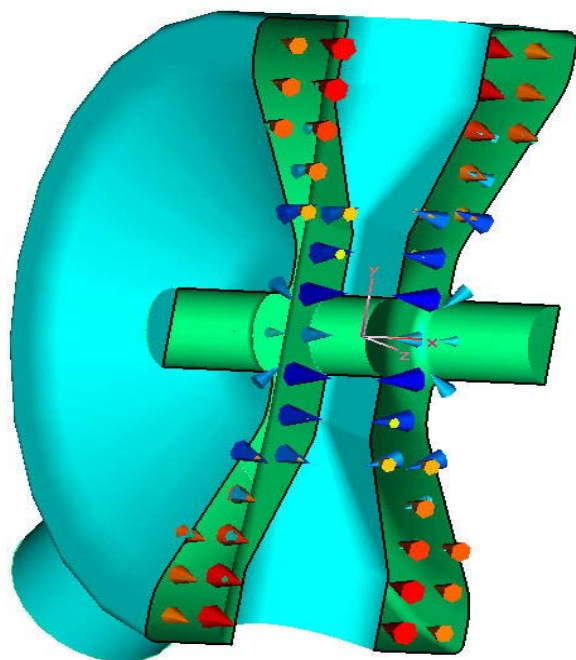
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Workshop on the Advanced Design
of Spoke Resonators Proceedings

Compiled by
Frank L. Krawczyk

Proceedings: Workshop on the Advanced Design of Spoke Resonators

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Editor: Frank Krawczyk, LANL

[Foreword](#) | [Participants](#) | [Acknowledgements](#) | [Program](#)

Foreword

In the last few years spoke resonators became serious candidates as accelerating structures for low velocity proton and ion beams. Starting from the early work by Jean Delayen and Ken Shepard and their colleagues various designs at different frequencies and betas have been demonstrated in low power tests. With the consideration of these resonators in recent linac designs (ATW, ESS, EURISOL, RIA, XADS) the next steps have to be taken to demonstrate their usefulness on real accelerators.

We organized this workshop to exchange and develop ideas that help demonstrating the value of these resonators in more realistic environments.

The attendance at this workshop represented all US and international groups that work in this field or that consider spoke resonators for their projects. The presentations at this workshop gave a very good overview on the progress that has been made in this field during the last few years. A wide range of different designs has been presented. The tests showed that with high standards for cleaning, spoke resonators are candidates for a reliable operation at gradients around 10 MV/m. The next generation of these resonator designs includes an extension of the technology to multigap spoke resonators with 2 or more spokes for higher real-estate gradients; and an extension to much higher betas up to 0.5 or higher. The latter is possible due to the large inherent stiffness of spoke resonators that reduce Lorentz Force Detuning and microphonics issues and thus makes them competitive or even superior to elliptical cavities for this velocity range. The presentations also demonstrated the progress made in understanding and developing the auxiliary components, like cryomodules, tuners and power coupler that are needed to operate spoke resonators on an accelerator.

These (electronic only) proceedings include the program for the 2 days of the workshop, the participant list, as well as abstracts, viewgraphs and discussion protocols for all presentations.

Frank L. Krawczyk
November 22, 2002

Participants

There was a total of 35 participants from 10 different laboratories and 3 companies. 25 of them were doing presentations or were chairing sessions. The participants came from 6 different countries: USA (18), Italy (6), France (5), Germany (4), Japan (1), Spain (1). Below you find an alphabetic listing by institution.

ACCEL:

Hanspeter Vogel

AES:

John Rathke
Tom Schultheiss

ANL:

Joel Fuerst
Mike Kelly
Ken Shepard

FZ Juelich:

Evgeny Zaplatin

INFN Legnaro:

Giovanni Bisoffi
Alberto Facco

INFN Milano:

Danilo Barni
Carlo Pagani
Paolo Pierini

Jlab:

Jean Delayen

LANL:

Mike Cappiello
Bob Garnett
Pat Kelley
Frank Krawczyk
Sergey Kurennoy
John Ledford
Debbie Montoya
George Neuschaefer
Dale Schrage
Alan Shapiro
Tsuyoshi Tajima
Tom Wangler

LLNL:

Brian Rusnak

MSU:

Terry Grimm
Felix Marti

Orsay:

Jean-Luc Biarrotte
Sebastien Bousson
Tomas Junquera
Jean Lesrel
Guillaume Olry

University of Frankfurt:
Andreas Sauer

Zanon:
Giorgio Corniani

Acknowledgments

For the local organization I want to thank Angelina Gurule-Sanchez, Lynette Trujillo, Dale Schrage and Tsuyoshi Tajima for their support. Without their help and criticism I could not have organized this meeting. John Ledford and Bruce Baille supported the videotaping of the workshop. Lynette Trujillo also helped with the proceedings.

From outside of Los Alamos I got a lot of help from Ken Shepard from ANL, Jean Delayen from Jlab and Brian Rusnak from Livermore. Without their comments the program would not be so nicely structured.

I finally want to thank all speakers and chair-people to help make this a fruitful meeting.

Workshop Program

Introduction

Opening Talk

Status of Projects

Specific Designs

Mechanical Designs

Tuner Designs

Fabrication

Test Results

Cavity Processing

Introduction 2nd Day

Controls/Microphonics

Power Couplers

Miscellaneous Issues

Cryomodules

Alternate Concepts

Closeout Session

Introduction

Frank Krawczyk: "*Introduction to the Workshop*"

([Viewgraphs](#))

Opening Talk

Jean Delayen: "*Medium Beta SC Structures*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Status of Projects

Ken Shepard: "*RIA Project: Driver Linac Overview*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Tomas Junquera: "*Status on Spoke Resonators R&D for two European Projects: XADS and Eurisol*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Evgeny Zaplatin: "*SC RF Cavity Activities at FZ Juelich*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Dale Schrage: "*The LANL Advanced Accelerator Applications (AAA) Program*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Paolo Pierini: "*Status of the High Current Proton Accelerator for the TRASCO Program*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Specific Designs

Ken Shepard: "*RIA Project: Spoke Cavity Design*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Guillaume Olry: "*CNRS: XADS/Eurisol*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Evgeny Zaplatin: "*Electrodynamics & Mechanics of Multigap Low-Beta SC Structures*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Frank Krawczyk: "*RF Design of Spoke Resonators for the AAA Project*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Giovanni Bisoffi: "*The Ladder Spoke Resonator at INFN Legnaro*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

All: "*General Discussion on RF-Design*"

([Discussion](#))

Mechanical Designs

Tom Schultheiss: "*Gusset Design and Analysis of the RIA Two Spoke Cavity*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Guillaume Olry: "*CNRS: XADS/Eurisol*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Dale Schrage: "*Mechanical Design of the AAA Beta=0.175 Spoke Resonator*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Tuner Designs

Brian Rusnak: "*Tuner Design for RIA*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Dale Schrage: "*Tuner for the AAA Beta=0.175 Spoke Resonator*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Fabrication

Ken Shepard/Joel Fuerst: "*2-cell Spoke Cavity Fabrication*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Jean Lesrel: "*The Fabrication of the First French Spoke Prototype*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Dale Schrage: "*Fabrication of the AAA Beta=0.175 Spoke Resonator*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Cavity Processing

Mike Kelly: "*Surface Processing of Spoke Cavities for RIA*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Sebastien Bousson: "*Processing of the First French Spoke Cavity*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Tsuyoshi Tajima: "*Preparation Procedures for Testing the LANL/AAA Spoke Cavities*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Test Results

Tsuyoshi Tajima: "*Test Results of the LANL/AAA Spoke Cavities*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Mike Kelly: "*ANL/RIA*" (Testing and processing were covered jointly in the processing session)

Introduction 2nd Day

Frank Krawczyk: "*Introduction to the Second Day*"

([Viewgraphs](#))

Controls/Microphonics

Jean Delayen: "*Controls - Overview*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Mike Kelly: "*Microphonics Measurements in Spoke Cavities*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Power Couplers

Brian Rusnak: "*Power Coupler Design for RIA*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Frank Krawczyk: "*Design of a Power Coupler for the AAA Spoke Resonators*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Miscellaneous Issues

Frank Krawczyk: *"Issues Related to the Modeling of Multipacting for Spoke Resonators"*

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Terry Grimm: *"Higher Order Modes in Spokes - Are they a Problem?"*

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Cryomodules

Joel Fuerst: "*Spoke Resonator Cryomodule Designs*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Jean-Luc Biarrotte: "*XADS/Eurisol Cryomodule - Options for a Highly Reliable Spoke Linac*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Pat Kelley: "*ADTF Spoke Cavity Cryomodule Concept*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Alternate Concepts

Ken Shepard: "*Spokes for Pulsed Operation*"

([Discussion](#))

Tsuyoshi Tajima: "*Consideration of 2K Operation*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Alberto Facco: "*Development of a 352 MHz, Low-beta Superconducting Reentrant Cavity at LNL*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Andreas Sauer: "*Multi-Cell SC CH-Cavity*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Bob Garnett: "*RF-Focused Spoke Resonator*"

([Abstract](#) | [Viewgraphs](#) | [Discussion](#))

Closeout Session

All: "*Closeout Discussion*"

([Discussion](#))

Tom Wangler: "Longitudinal Beam-Dynamics Constraint on the
Accelerating Gradient"

([Discussion](#))

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